Microwave Circuit Design by Using Metamaterial Concepts

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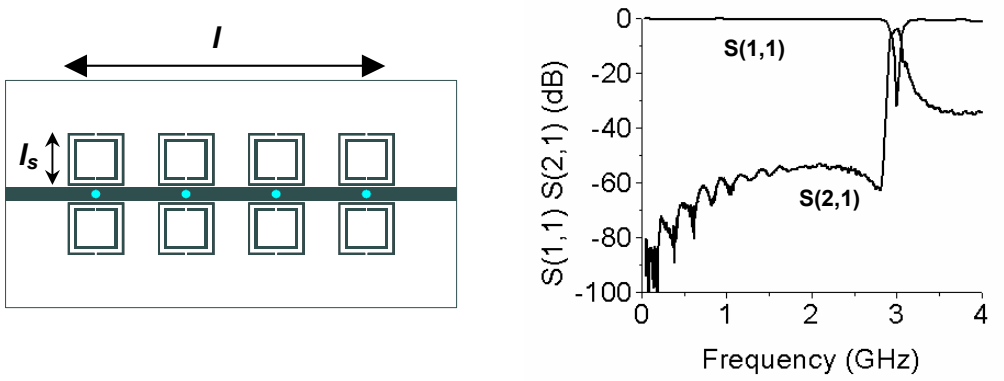
In this work, the recent results obtained by the authors related to the design of microwave circuits based on the concept of metamaterial will be presented [1]. The focus is essentially put on split rings resonators (SRRs) based devices, as well as on other devices based on related topologies, including the complementary split ring resonator (CSRRs). By properly coupling these metamaterial constituent *atoms* to planar transmission lines (microstrip, CPW,…) and additional microstructuring, it will be shown that various types of microwave devices can be designed and fabricated. The authors have mainly oriented their efforts to the design of planar filters and multiplexers, but other microwave devices can be also envisaged. To illustrate the potentiality of the approach, in Fig. 1 is presented a left handed transmission line in microstrip technology, where square shaped SRRs and metallic via holes periodically load the line. Above the resonant frequency of the SRRs the structure exhibits an effective negative value of the permittivity and permeability, this leading to a pass band with backward wave propagation. This and other experimental results, not presented in this abstract, encourage the authors to continue this research activity with the hope of finding actual microwave applications of metamaterials, including double negative as well as single negative index metamaterials.

[1] See the web page of the authors: http://www.etse.uab.es/gemma/.



(a) **(b)**

Fig. 1. Layout of a typical left handed microstrip transmission line based on SRRs (a) and measured frequency response (b). SRRs side dimensions are l_s=5mm, and the length of the device, excluding access lines is l=0.63λ, λ being signal wavelength at f_o.